

# **Appendix 8B-1: Annual Permit Compliance Monitoring Report for Non-Everglades Construction Project Discharge Structures**

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## **INTRODUCTION**

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The non-Everglades Construction Project (non-ECP) permit (Florida Department of Environmental Protection No. 06,502590709) authorizes the South Florida Water Management District to operate and maintain structures (currently 38 structures), in compliance with the reporting requirements stated in Specific Conditions 5 and 12 of the non-ECP permit.

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## **METHODS**

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### **WATER QUALITY AND HYDROLOGIC DATA**

The water quality and hydrologic data evaluated in this appendix were retrieved from the South Florida Water Management District's (SFWMD's or District's) DBHYDRO database. Before water quality data are entered into the database, the District follows strict quality assurance/quality control (QA/QC) procedures outlined in the Florida Department of Environmental Protection (FDEP)-approved Comprehensive Quality Assurance Plan (CompQAP, No. 870166G) (SFWMD, 1999a). The CompQAP provides assurances that the water quality monitoring program is providing accurate data and that sufficient progress is being made toward achieving water quality standards.

Methods for hydrologic data collection are documented in the Guidelines for the Collection of Hydrologic and Meteorologic Data (SJRWMD et al., 1994). The QA/QC procedures for hydrological data are found in the Guidelines for Quality Control and Quality Assurance of Hydrologic and Meteorological Data (SJRWMD et al., 1999).

### **PERMIT SAMPLING SITES**

In addition to authorizing the operation and maintenance of non-Everglades Construction Project (non-ECP) structures, the non-ECP permit requires a routine water quality monitoring program to characterize the quality of water discharged through District structures. Currently, the non-ECP permit requires monitoring at four additional C-111 basin structures (upstream) that are

controlled by the District, two structures that are controlled by the Village of Wellington (VOW), and one structure that is controlled by the North Springs Improvement District (NSID).

The District typically collects water quality samples on the upstream side of a structure or at a nearby location representative of the quality of water flowing through a structure. Structure locations are shown in **Figure 1**. In accordance with Specific Condition 16, the District previously submitted a Monitoring Locations Report to the FDEP on July 15, 1998 that included detailed information on the specific locations for sample collection for 44 structures. On August 9, 2001, the District submitted a minor modification to the non-ECP permit to include phase I of the Western C-11 Basin Critical Restoration Project (including operation and maintenance of the S-9A pump station). The current monitoring program encompasses 38 locations that provide the representative information to characterize the quality of water discharged through the 45 structures. The structure names, representative water quality monitoring location names, and sampling frequencies of the various categories of chemical constituents and physical properties required by the monitoring schedule denoted in the permit are shown in Appendix 8B-1a, Table 1.

## **PERMIT DATA ANALYSIS PERIODS**

Specific Condition 12 requires the District to submit annual monitoring reports providing updates on water quality data and associated comparisons with state water quality standards. The water quality characterization includes an evaluation of compliance with Class III criteria for each monitoring location representative of a non-ECP structure.

Appendix 8B-1 provides the annual update of the non-ECP permit monitoring program (Specific Condition 12) and a comparison of water quality data at non-ECP structures to state water quality standards from Water Year 2003 (WY2003) (May 1, 2002 to April 30, 2003), the sixth year of non-ECP data. These comparisons fulfill the non-ECP permit requirements to measure progress toward achieving and maintaining compliance with state water quality standards.



## Method Detection Limits

Each water quality constituent has a method detection limit (MDL) that essentially defines the minimum concentration, or level, at which the constituent can be quantified. The MDL is usually twice the background noise level associated with a test and represents that level at which the presence of the analyte can be reliably determined. The MDL does not represent a level at which an exact measurement can be determined. The practical quantitation limit (PQL) represents the lowest level achievable among laboratories within specified limits during routine laboratory operations and for which a measurement can be considered quantifiably reliable for a constituent. Generally, the PQL is four times the MDL, although different laboratories may establish PQLs at two to five times the MDL. In Appendix 8B-1, trace metal data that were reported to be less than the MDL were assigned a value equal to the MDL. Total phosphorus (TP) data that were less than the MDL of 4.0 micrograms per liter ( $\mu\text{g/L}$ ) (or parts per billion [ppb]) were assigned a value of 4.0 ppb to provide a conservative basis for statistical analysis. For pesticide detections, concentrations greater than the PQL were considered reliable.

## EXCURSION ANALYSIS FOR CLASS III CONSTITUENTS AND PESTICIDES

To evaluate compliance with water quality criteria in WY2003, constituent concentrations were compared to their respective Class III numeric criteria. If a constituent concentration exceeded its numeric criteria, then an excursion was recorded and the total number of excursions and the percent of excursions for the non-ECP structures were tabulated.

## Trace Metals and Un-ionized Ammonia

The un-ionized portion of dissolved ammonia measured in a water sample was calculated and compared to the 0.02-milligram per liter ( $\text{mg/L}$ ) criterion only if temperature and pH values had been recorded for that sample. For trace metals, the most recent trace metal criteria were used for evaluating the data even if the criteria had changed over time. When comparing the calculated criteria with trace metal concentrations, only water samples were used if hardness values were determined from that same sample, i.e., no extrapolations were made to samples without hardness data. The equations used in this appendix for calculated criteria for trace metals and un-ionized ammonia were derived from the equations listed in Rule 62-302.503, Florida Administrative Code (F.A.C.).

## Total Phosphorus

The data for total phosphorus are presented in this appendix in time series plots and statistical box plots. For TP, any site with data  $> 50$  ppb would be viewed as a “concern”, any site with data  $> 10$  ppb would be viewed as a “potential concern”, and any site with data  $< 10$  ppb would be viewed as “no concern”. This approach is consistent with the federal Settlement Agreement (i.e., Settlement Agreement dated July 26, 1991, entered in Case No. 88-1886-Civ-Hoeveler, U.S. District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001), which indicates that the District’s Stormwater Treatment Areas (STAs) are located and sized to deliver a uniform, long-term, annual flow-weighted mean TP concentration of 50 ppb or less at each inflow point to the Everglades Protection Area (EPA). Additionally, the Everglades Forever Act (EFA) mandates that the default TP criterion shall be 10 ppb in the EPA in the event that the FDEP does not adopt by rule such a criterion by December 31, 2003. There are additional TP concentration compliance limits for inflows to the

Everglades National Park (ENP or Park) by way of Shark River Slough (S-12S and S-333), Taylor Slough (S-332 and S-175), and the coastal basin (S-18C) outlined in Appendix A of the Settlement Agreement. However, Appendix 8B-1 does not track compliance with the interim or long-term TP concentration limits set forth in the Settlement Agreement.

The District's categories of concern, potential concern, and no concern are based on a common-sense understanding of water resources protection. These terms, however, are not intended to be interpretations of state water quality standards or state water quality law. The FDEP, not the District, is responsible for interpreting whether a given constituent violates the numeric criterion, the narrative criterion, a water body's designated uses, or the antidegradation policy.

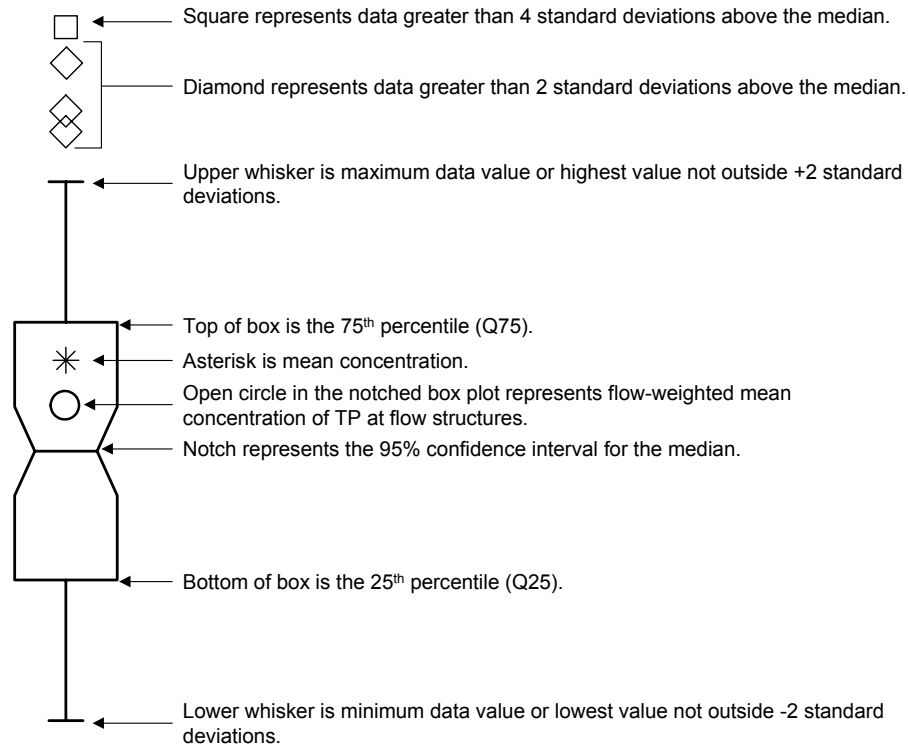
## **Pesticides**

The Everglades Protection Area pesticide monitoring program includes non-ECP permitted structures. For purposes of Appendix 8B-1, the WY2003 surface water pesticide analyses are presented in tables for the non-ECP structures only. The sediment pesticide analyses for WY2003 are presented in a separate table. Five upstream structures in the C-111 basin are included in the pesticide monitoring program and represent potential warning sites for pesticides that might be discharged into the Park.

## **DESCRIPTION OF NOTCHED BOX AND WHISKER PLOTS**

Notched box and whisker plots were created to summarize data for each constituent that exceeded its numeric criteria. These plots also summarize the TP data collected at all monitoring locations. A notched box and whisker plot summarize selected statistical properties of the data sets. Notched box and whisker plots can be used to test for statistical significance between data sets at roughly a 95 percent confidence interval, to detect changes in constituent concentration variability over time, and to determine if trends exist. The notched box and whisker plots used for these summaries are based on McGill et al. (1978) (**Table 1**).

It is recognized that using notched box and whisker plots to determine differences between data sets with large differences in sample size may cause significant findings that are artifacts of the number of samples and the amount of variation in the data sets. The objective of providing the plots was to compare data from the current water year (WY2003) to those in previous individual permit water years (WY1998, WY1999, WY2000, WY2001, and WY2002) and previously established baseline data sets for the non-ECP discharge structures.

**Table 1.** Description of notched box and whisker plots used in Appendix 8B.

1. Notches surrounding the medians provide a measure of the significance of differences between notched box plots. If the notches about two medians do not overlap, then the medians are significantly different at about a 95-percent confidence level.
2. At times, the variability in a data set may be quite high. When highly variable data are presented in a notched box and whisker plot, the width of the notch may be greater than the 25th or 75th percentile. When this occurs, the box plot appears as if it is folded from the end of the notch back towards the median. This is done automatically by the statistics program to save space within the figure being presented.
3. Notches are calculated using the following equation:

$$Notch = Median \pm \frac{1.58(Q75 - Q25)}{\sqrt{n}}$$

Where: n = number of data points

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## **RESULTS: WATER QUALITY EVALUATION AND EXCURSION ANALYSIS**

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In accordance with Specific Conditions 5 and 12(h) of the non-ECP permit, this section presents an update of constituent concentrations and physical properties measured during WY2003 (May 1, 2002 through April 30, 2003), the sixth year of non-ECP permit monitoring. For standards with numeric criteria, the data from the structures were assessed for compliance with those standards using the procedures in Rule 62-4.246, F.A.C. For parameters that have narrative water quality criteria, the concentrations obtained at each structure were reported using plots and summary statistics.

### **MONITORING OF PHYSICAL PARAMETERS, NUTRIENTS, MAJOR IONS, AND TRACE METALS**

#### **Descriptive Statistics**

A summary of the data begins with a presentation of descriptive statistics for all water quality constituent concentrations and physical properties (excluding pesticides and priority pollutants) measured for non-ECP monitoring locations during WY2003 (Appendix 8B-1b, Table 2). The descriptive statistics (summary tables) are presented by monitoring location for each water quality parameter collected for the site. A reference is also provided in Appendix 8B-1b, Table 1, reflecting current state Class III criteria.

The statistical summary tables report the range of constituent concentrations, median values, the number of sample observations, selected data percentiles (25th and 75th), and flag parameters exhibiting excursions from Class III numeric criteria. Concentrations observed to be less than the lower limit of the analytical method (MDL) were set equal to the MDL for statistical analysis.

For parameters, such as nutrients, that have only narrative criteria, the tables provide basic information to assist with identifying water quality constituents that might be of concern. TP is the nutrient deemed to be of particular concern for the non-ECP structures. Additional discussion on this topic is provided in this section.

#### **Excursions from Class III Criteria (Numeric)**

Further analysis of excursions from Class III criteria was accomplished by summarizing the excursions, plotting the data for parameters exhibiting the excursions, discussing the parameters, and noting which ones are a concern. The excursion analysis is based on 11 water quality parameters (with a numeric criteria), shown in **Table 2**, that were collected for the non-ECP monitoring program and can be compared with applicable Class III water quality criteria listed in Rule 62-302.530, F.A.C.

**Table 2.** Summary of total number of excursions from state Class III criteria for all non-ECP monitoring sites during WY2003 (May 1, 2002 through April 30, 2003) and previous periods.

Parameter	WY2003	WY2002	WY2001	WY2000	WY1999	WY1998	Non-ECP Baseline	EFA Baseline
Total Alkalinity	1:471	0:475	0:490	0:559	0:502	0:525	0:2845	1:2677
Dissolved Oxygen	436:649	456:597	455:637	558:697	485:581	459:551	2177:3018	1694:2615
Specific Conductance	1:664	0:600	2:637	5:698	0:589	3:551	12:3058	59:2615
pH	2:666	1:611	1:637	1:698	10:589	12:551	37:3008	6:2586
Turbidity	1:470	2:479	1:489	3:645	4:504	0:527	12:2842	10:2637
Un-ionized Ammonia	0:477	0:478	3:485	1:622	20:501	7:448	10:2661	12:2548
Total Iron	0:72	0:74	1:186	0:270	1:244	0:261	5:1655	5:836
Total Cadmium	0:31	0:30	0:101	0:133	0:126	1:127	4:785	9:362
Total Lead	ND	ND	0:77	0:119	0:112	0:120	2:785	1:364
Total Copper	0:35	0:29	0:101	0:132	0:126	0:127	0:779	1:373
Total Zinc	0:31	0:25	0:100	0:129	0:125	0:127	2:786	3:363

Notes: 1<sup>st</sup> number indicates number of excursions; 2<sup>nd</sup> number indicates total number of samples collected.

ND = no data

WY2003 (May 1, 2002 through April 30, 2003); WY2002 (May 1, 2001 through April 30, 2002); WY2001 (May 1, 2000 through April 30, 2001); WY2000 (May 1, 1999 through April 30, 2000); WY1999 (May 1, 1998 through April 30, 1999); WY1998 (May 1, 1997 through April 30, 1998); non-ECP Baseline (October 1, 1988 through April 30, 1997); and EFA Baseline (October 1, 1978 through September 30, 1988).

Of the 11 parameters listed in **Table 2**, dissolved oxygen (DO), pH, alkalinity, specific conductance, and turbidity exhibited excursions at one or more locations during WY2003. Previous non-ECP annual monitoring reports provided summary tables showing the total number of excursions by individual monitoring location (SFWMD 2003, 2002, 2001, 2000, 1999b, and 1999c). **Table 2** summarizes the previously reported information and compares the results with the current water year. A summary of observed excursions from Class III criteria for individual non-ECP monitoring locations during WY2003 is presented in **Table 3**. The monitoring locations are categorized in the table as either “into,” “within,” “from,” or “C-111 basin” locations as defined by the non-ECP permit.

Calculated criteria for the parameters were derived from the equations listed in Rule 62-302.530, F.A.C. When comparing the calculated criteria with trace metal or major ion concentrations, the only samples used were those in which hardness values were determined in the same sample as that of the trace metal or major ion.

For parameters that exceeded Class III criteria during WY2003, time series plots and box whisker plots are provided in Appendix 8B-1c. These plots report the range of the data and the magnitude of the excursions and assist with detecting whether there are any increasing or decreasing trends observed in the data. To assess how far a physical parameter, major ion, or trace metal deviated above or below a Class III numeric criterion, a percent-departure line was added to the time series plots and box and whisker plots. These departure lines indicate whether a parameter value ranges more than 1, 10, or 100 percent beyond the numeric criteria. The physical parameters appear as horizontal lines across the plots. For the major ions and trace metals, the criteria change from sample to sample because the criteria for each parameter for a particular sample were calculated based on the hardness data calculated from the same sample. For data values that show an excursion, the percentage departure is annotated on the plot above the data value.

### ***Dissolved Oxygen***

Dissolved oxygen (DO) concentrations exhibited consistent excursions from Class III criteria during WY2003 (**Table 3**). About 67 percent (436 out of 649 samples) of DO concentrations measured at the non-ECP monitoring locations were less than the minimum criterion of 5 mg/L. The DO concentrations measured for WY2003 are consistent with the concentration levels and the frequency of excursions observed in previous water years, and there is a slight improvement (67 percent versus 76 percent) for DO excursions for WY2003 compared with WY2002. The DO excursions occurred at all locations. The DO time series and box and whisker plots are shown in Appendix 8B-1c.

### ***Specific Conductance***

Specific conductance was measured in 664 samples collected from the monitoring sites. Of these samples, one detected value exhibited an excursion exceeding the Class III criteria for specific conductance. The criteria for Class III waters requires that specific conductance not exceed a level greater than 50 percent above background, or 1,275 microhms per centimeter ( $\mu\text{mhos/cm}$ ), whichever is greater. Specific conductance is not a parameter of concern for the non-ECP monitoring locations.

### ***pH***

The pH of a solution is defined as the negative base-10 logarithm of the hydrogen ion activity and can range from 0 (very acidic) to 14 (very alkaline). For freshwater systems, the Class III criteria for pH ranges from 6.0 to 8.5 units. For WY2003, excursions from the pH criterion occurred in less than 1 percent (2 out of 666) of the samples collected. As shown in **Table 3**, only one excursion with a pH greater than 8.5 units was observed at the S-143 site and one excursion with a pH less than 6.0 units was observed at NSID1 site. The pH data for S-143 and NSID1 are plotted in Appendix 8B-1c. This parameter is not a concern for structures going into the EPA.

**Table 3.** Summary of excursions from state Class III surface water criteria for individual non-ECP monitoring sites during WY2003.

AREA	STRUCTURE	SAMPLING SITE	PARAMETERS										
			Alkalinity	DO	Specific Conductance	pH	Turbidity	Un-Ionized Ammonia	Iron	Cadmium	Lead	Copper	Zinc
INTO	ACME1DS	ACME1DS	(0 : 12)	(3 : 12)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	ACME1 (Upstream of ACME1DS)	VOW1	-ND-	(4 : 4)	(0 : 4)	(0 : 4)	-ND-	(0:2)	-ND-	-ND-		(0:2)	-ND-
	G-94D	G94D	(0 : 13)	(5 : 13)	(0 : 13)	(0 : 13)	(0 : 13)	(0 : 13)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	ACME2 (Upstream of G94D)	VOW2	-ND-	(2 : 3)	(0 : 3)	(0 : 3)	-ND-	(0 : 2)	-ND-	-ND-		(0 : 2)	-ND-
	G-123	G123	(0 : 12)	(9 : 30)	(0 : 31)	(0 : 31)	(0 : 12)	(0 : 12)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-9	S9	(0 : 18)	(41 : 49)	(0 : 50)	(0 : 51)	(0 : 16)	(0 : 17)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-9A	S9A	(0 : 2)	(23 : 26)	(0 : 26)	(0 : 26)	(0 : 8)	(0 : 9)					
	S-14	S14						(0 : 0)	(0 : 1)	(0 : 2)		(0 : 2)	(0 : 2)
	S-18C	S18C	(0 : 17)	(15 : 35)	(0 : 35)	(0 : 35)	(0 : 17)	(0 : 17)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-140	S140	(1 : 19)	(11 : 33)	(0 : 35)	(0 : 35)	(0 : 17)	(0 : 18)	(0 : 5)	(0 : 2)		(0 : 2)	(0 : 2)
	S-175	S175	(0 : 13)	(22 : 26)	(0 : 26)	(0 : 26)	(0 : 13)	(0 : 13)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-190	S190	(0 : 16)	(6 : 17)	(0 : 17)	(0 : 17)	(0 : 16)	(0 : 16)	(0 : 5)	(0 : 2)		(0 : 2)	(0 : 2)
	S-332	S332	(0 : 12)	(25 : 25)	(0 : 25)	(0 : 25)	(0 : 12)	(0 : 12)	(0 : 3)	(0 : 2)		(0 : 2)	(0 : 2)
	NSID1	S38B	(0 : 4)	(1 : 3)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 1)		(0 : 1)	(0 : 1)
	NSIDSP01			(0 : 4)	(0 : 4)	(1 : 4)		(0 : 0)					
WITHIN	G-64	G64	(0 : 4)	(2 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)					
	G-69	G69	No Data (Structure Closed)										
	G-71, S-346, S-347	S12D	(0 : 26)	(25 : 26)	(0 : 26)	(0 : 26)	(0 : 26)	(0 : 24)					
	S-10E	S10E	(0 : 12)	(5 : 12)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 12)					
	S-141	S34	Same as Data for S34 Shown Below										
	S-142	S142	(0 : 15)	(8 : 14)	(0 : 15)	(0 : 15)	(0 : 15)	(0 : 15)					
	S-143	S11A	(0 : 16)	(3 : 14)	(1 : 16)	(1 : 16)	(0 : 16)	(0 : 16)					
	S-144	S144	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-					
	S-145	S145	(0 : 18)	(11 : 16)	(0 : 18)	(0 : 18)	(0 : 18)	(0 : 18)					
	S-146	S146	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-					
	S-151	S151	(0 : 16)	(10 : 16)	(0 : 16)	(0 : 16)	(0 : 15)	(0 : 16)					
	S-333	S333	(0 : 26)	(27 : 31)	(0 : 31)	(0 : 31)	(0 : 26)	(0 : 26)	(0 : 5)	(0 : 2)		(0 : 2)	(0 : 2)
	S-339, S-340	C123SR84	(0 : 15)	(7 : 13)	(0 : 14)	(0 : 15)	(1 : 14)	(0 : 15)					
	G-94A, G-94B, G-94C	G94B	(0 : 12)	(10 : 12)	(0 : 12)	(0 : 12)	(0 : 11)	(0 : 12)	(0 : 4)				
FROM	S-31, S-337	S31	(0 : 4)	(4 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)					
	S-34	S34	(0 : 17)	(3 : 16)	(0 : 17)	(0 : 17)	(0 : 17)	(0 : 17)					
	S-38	S38	(0 : 9)	(5 : 7)	(0 : 9)	(0 : 9)	(0 : 9)	(0 : 9)					
	S-39	S39	(0 : 19)	(6 : 20)	(0 : 20)	(0 : 20)	(0 : 19)	(0 : 19)	(0 : 1)				
	S-197	S197	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-					
	S-334	S334	(0 : 16)	(10 : 15)	(0 : 16)	(0 : 16)	(0 : 16)	(0 : 16)					
	S-343A, S-343B	US41-25	(0 : 20)	(24 : 25)	(0 : 25)	(0 : 25)	(0 : 20)	(0 : 19)					
	S-344	S344	(0 : 4)	(3 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)					
C-111 BASIN	S-174	S176	(0 : 14)	(13 : 14)	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-177	S177	(0 : 17)	(15 : 18)	(0 : 18)	(0 : 18)	(0 : 17)	(0 : 17)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-178	S178	(0 : 15)	(13 : 16)	(0 : 16)	(0 : 16)	(0 : 15)	(0 : 15)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	S-331, S-173	S331-173	(0 : 21)	(21 : 22)	(0 : 22)	(0 : 22)	(0 : 21)	(0 : 21)					
	S-332D	S332D	(0 : 17)	(44 : 50)	(0 : 50)	(0 : 50)	(0 : 17)	(0 : 17)	(0 : 4)	(0 : 2)		(0 : 2)	(0 : 2)
	Totals		(1 : 471)	(436 : 649)	(1 : 664)	(2 : 666)	(1 : 470)	(0 : 477)	(0 : 72)	(0 : 31)		(0 : 35)	(0 : 31)

Notes: 1st number in parenthesis indicates number of excursions. 2nd number in parenthesis indicates total number of samples collected. Bold numbers indicate excursions from state class III criteria. -ND- indicates that no data was collected.

### ***Alkalinity***

The criterion for Class III waters requires that alkalinity not measure below 20 mg/L. Alkalinity was measured in 471 samples taken during WY2003. Of these samples, S-140 had one sample value (<1 mg/L) flagged as a potential excursion. The median alkalinity value for this site was 186.8 mg/L (Appendix 8B-1b, Table 3). Alkalinity does not appear to be a parameter of concern, since excursions have only occurred on one occasion during the past several water years.

### ***Turbidity***

The criterion for Class III waters requires that turbidity not exceed 29 nephelometric turbidity units (NTU) above natural background conditions. In general, the median value can be used to determine the average background levels on a site-to-site basis for the non-ECP monitoring locations to compare the measured turbidity at a site with Class III criteria. For instance, if background levels at a particular location indicate a median turbidity level of approximately 3 NTU and a turbidity measurement of 30 NTU was measured, then this would indicate that the measurement is 27 NTU above background levels. This measurement would not be considered an excursion, although the 30-NTU measurement might be construed as an excursion of the criterion in the absence of sufficient background data to calculate a median value for comparison.

Turbidity was measured in 470 samples collected during WY2003. The majority of the data are characterized by low turbidity values. Out of 470 samples, one sample collected at S-339 with a turbidity reading of 29.1 NTU was flagged as a potential excursion. The median turbidity value for this site was 1.675 NTU (Appendix 8B-1b, Table 3). Turbidity does not appear to be a parameter of concern, since excursions have only occurred on a few occasions during the past several water years.

### ***Un-Ionized Ammonia***

The Class III surface water quality criterion for ammonia was established for the un-ionized portion of dissolved ammonia. The un-ionized portion of dissolved ammonia measured in a water sample can be calculated and compared to the Class III criterion only if temperature and pH have been recorded for that sample. None of the 477 samples analyzed for un-ionized ammonia at all locations during WY2003 had concentrations that exceeded its criterion of 0.02 mg/L. During WY2001, the results for un-ionized ammonia in 3 out of 30 samples collected at S-142 exceeded this criterion. The situation improved in WY2002 and WY2003, and no excursions for un-ionized ammonia were observed in the surface waters discharging to the Park through non-ECP structures. In previous non-ECP monitoring reports, this parameter was identified as a potential concern for structures discharging “into” the Park and the upstream structures in the C-111 basin. Because no excursions were evident in the data for WY2003, un-ionized ammonia is not a concern in the upstream C-111 basin structures and the “into” structures discharging to the Park from the basin, indicating a significant improvement when compared with WY2001 results.

### ***Trace Metals and Total Iron***

Quarterly monitoring for total iron and the trace metals cadmium, copper, and zinc is conducted in accordance with the monitoring requirements of the non-ECP permit. There were no observed iron or trace metal concentrations in WY2003 that exceeded their respective Class III criteria. These metals are not parameters of concern for the non-ECP monitoring locations.

## Evaluation of Total Phosphorus

The non-ECP permit established the monitoring schedule shown in Appendix 8B-1a for the collection of TP at non-ECP structures. Sample collection is accomplished mainly through a grab-sample collection program. Grab samples are collected biweekly for a majority of the structures when flow is occurring at the structure; otherwise, collection is conducted at least once a month. A few exceptions exist for some non-ECP structures, where sampling is conducted biweekly only during flow events. Nutrients are the most frequently sampled parameters in the non-ECP monitoring program.

During WY2003, auto-samplers collected TP samples weekly at the ACME1, ACME2, S-9, S-9A, S-18C, S-190, S-140, NSID1 (S-38B), and G-123 pump structures. Deployment of the auto-samplers at these locations was previously identified as an improvement in the monitoring program for collecting TP data at “into” structures. Auto-samplers also collected samples at the S-332D structures located in the C-111 basin that discharge water into the S-332D detention area east of the Park.

The TP concentration data collected for all monitoring locations during WY2003 (the sixth year of non-ECP permit monitoring) are plotted in time series and notched box and whisker plots in Appendix 8B-1d. The plots are designed to provide a comparison of TP concentration data between WY2003 and previous periods (WY2002, WY2001, WY2000, WY1999, WY1998, EFA baseline, and non-ECP baseline) to detect changes and trends in TP concentrations at non-ECP monitoring locations. To assist with evaluation of the TP concentration data for a particular location discharging “into,” “within,” or “from” the EPA, horizontal lines representing the 10 ppb and 50 ppb concentration levels were added to the TP time series and notched box and whisker plots. TP concentrations are reported in ppb (or  $\mu\text{g/L}$ ) unless otherwise noted.

For WY2003, a statistical comparison of TP concentration data for all monitoring locations is presented as notched box and whisker plots in **Figures 2a** through **2d**. The figures represent “into” (**Figure 2a**), “within” (**Figure 2b**), and “from” (**Figure 2c**) monitoring locations. Additionally, notched box and whisker plots were constructed for TP concentration data for the upstream C-111 basin monitoring locations (**Figure 2d**). Summary statistics of TP data collected for all monitoring locations are presented as a separate table in Appendix 8B-1b, Table 3 (grab and auto-sampler data are reported separately). A discussion of the TP concentration data observed during WY2003 is provided below.

### ***“Into” Structures***

Some of the highest TP concentrations for non-ECP structures discharging directly to the EPA during WY2003 were observed for the monitoring locations at the VOW2, VOW2Auto, ACME1DS, and G-94D culverts and the upstream pump stations (**Figure 2a**). Weekly auto-sampler collection and biweekly grab samples at the respective upstream monitoring locations VOW1 (ACME pump station 1) and VOW2 (ACME pump station 2) were initiated in July 2000 based on a monitoring agreement between the District and the Village of Wellington (VOW).

The ACME1DS and G-94D culverts, operated by the VOW, remain open at all times and discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) when upstream pump stations ACME1 or ACME2 are operating. Sixteen District data collection trips to the culvert monitoring locations resulted in only 9 sampled flow events. The monitoring agreement with the VOW resulted in a sufficient number of samples (37) collected by both grab and auto-samplers upstream of the pump stations to cover a broad range of flows observed during pumping events and to adequately characterize the TP concentrations.

More than 75 percent of the data collected at the upstream VOW1 monitoring sites were below 88 ppb, with median TP values ranging between 43 and 72 ppb. More than 75 percent of the data collected at the upstream VOW2 monitoring sites were below 100 ppb, with median TP values ranging between 62 ppb and 89 ppb. Discharge data were not available for the ACME1DS and G-94D culverts, although discharge data from the upstream pump stations during WY2003 (8,813 acre-feet [ac-ft] for ACME1 and 9,469 ac-ft for ACME2, respectively) can be used as an indication of the magnitude and occurrence of flow through the downstream culverts.

Additionally, high TP concentrations were observed for structures S-190 (feeder canal basin) and S-140 (L-28 basin), with median TP concentrations of 42 ppb and 36 ppb, respectively. During WY2003, structure S-190 discharged 88,026 ac-ft, and S-140 discharged 136,367 ac-ft into the western portion of WCA-3A.

The lowest TP concentrations were observed at structures in the C-111 basin at S-18C, S-174, S-177, S-331, S-173, and S-332D. These structures discharge to the southeastern portion of the Park by way of the C-111 canal and Taylor Slough. The TP data for these monitoring locations had median concentrations of 5 ppb for S-18C, 7 ppb for S-175, and 7 ppb for S-332, with 75 percent of the samples having concentrations below 6 ppb for S-18C, 9 ppb for S-175, and 8 ppb for S-332. During WY2003, the S-175 and S-332 structures were operated infrequently, discharging only 2,396 ac-ft for S-175 and 547 ac-ft for S-332 to the Park. The S-18C structure discharged approximately 134,932 ac-ft to the lower C-111 canal. S-178 had an average concentration of 29 ppb, the highest TP concentration in the C-111 basin, with a negative discharge of 598 ac-ft.

Structures S-9 (C-11 West basin) and G-123 (North New River basin) discharge directly to the eastern side of Water Conservation Area 3A (WCA-3A). The notched box and whisker plot for S-9, which is based on grab-sample data, indicates a TP concentration of less than 20 ppb for 75 percent of the data, a median concentration of 17 ppb, and a maximum concentration of 37 ppb (**Figure 2a**). In contrast, 75 percent of the data collected by the auto-sampler at S-9 is below 18 ppb, with a median concentration of 15 ppb and a maximum concentration of 28 ppb. G-123 exhibits a maximum concentration of 57 ppb. The monitoring schedule for structure G-123 requires biweekly grab sampling during flow events; otherwise, the samples are collected monthly. An auto-sampler collected samples every 7 days, resulting in 48 auto-samples and 30 grab samples collected during this period. During WY2003, procedures were also instituted to allow the determination of the volume of water discharged from the North New River Canal into the EPA. Previously, only an annual volume could be estimated. The structure did not discharge water over the entire period. The auto-sampler and grab sample TP values at G-123 were similar and had a median concentration of 16 ppb for auto-samples and 23 ppb for grab samples. Seventy-five percent of the data ranged from 25 ppb to 28 ppb, with a maximum concentration of 57 ppb for grab samples and 42 ppb for auto-samples.

The North Springs Improvement District (NSID) operates several pump stations to remove excess runoff from the basin. The flow-proportional auto-sampler, headwater pressure sensor, and calibrated flow monitoring equipment with telemetry that monitor the NSID's pump station discharges into Water Conservation Area 2A (WCA-2A) are functioning for the NSID basin. The surface water quality monitoring program has continued at the NSID pump station S-38B. No upstream water quality monitoring samples have been collected at NSIDSP01 during times of flow. Results from S-38B, and upstream data from NSIDSP01, are reported in Chapter 8B, Table 8B-1. A more complete presentation of the results from these stations can be found in Appendix 8B-1b, Table 3, and Appendix 8B-1e. Operation of the auto-sampler and telemetry equipment used to collect the data was delayed due to unforeseen pump repairs. The repairs have since been completed, and pump testing was performed. Pump curves were developed and programmed into the equipment. All systems are now operational and have not provided flow-weighted, proportional sampling data results for the WY2003 compliance report because no valid TP data was recorded from the auto-sampler at the NSID during WY2003.

Pump station 1 (NSID1) has the capability to discharge directly to WCA-2A, though discharges occur relatively infrequently. The NSID1 pump discharged approximately 688 ac-ft to WCA-2A during WY2003. The sampling location, designated as S-38B, is on the WCA-2A side of the structure. During WY2003, no samples were collected at S-38B during a flow event. The TP concentrations for the four samples collected at NSID1 ranged from 12 ppb to 69 ppb. Auto-sampling equipment for flow-proportional TP sampling has been installed at the NSID in WY2002 but no valid TP data has yet been recorded. There was no valid TP data for grab samples at the NSIDSP01 site during WY2003 because the failure of QA/QC requirements.

The remaining structure, S-14, is in the northwest corner of Shark River Slough in the Park. The structure is situated a short distance to the west of the S-12A structure. According to operational records, the S-14 structure remained closed during WY2003. Operational records also indicate that the structure has been closed since 1986. Therefore, routine sampling for TP was not conducted at this location in accordance with the "biweekly if flowing" sampling schedule required by the permit. In the event that this structure was operated, it would convey some of the discharge from WCA-3A outflow structures S-343A and S-343B, and some overland runoff from the southeastern portion of Big Cypress National Preserve to the Park.

During WY2003, the water quality monitoring program has been ongoing in the Boynton Farm basin. Although access limitations and other boundary issues still exist, surface water quality samples for most of the identified "into" structures have been obtained during times of flow. Recently, the Williams Nursery pump on the north side of the Refuge was voluntarily removed. As part of the expansion work for State Road 7 to the east of the remaining farm properties, the Lake Worth Drainage District is continuing its efforts to provide sufficient capacity to allow all discharges from the remaining farms to flow east. This would eliminate the need for these farms to pump west into the Refuge.

The headquarters property is owned and operated by the U.S. Fish and Wildlife Service (USFWS) and is bordered by several farms immediately east of the property boundary that discharge onto the property. The headquarters property is identified in the EFA as being within the EPA boundary, but the property is east of the protective levee, has no connection to discharge westward to WCA-1, and stands alone as an isolated parcel. During WY2003, data collected for the Amestory Farm include sites BFBAFCP, BFBAFNP, and BFBAFSP; data collected for the Dubois Farm include sites BFBDFCP, BFBDFNP, BFBDFSP, and BFBDFWP; data collected for the Mecca Farm include sites BFBMFCP, BFBMFSP, and BFBMFNP; and data collected for the Williams Nursery include site BFBWNCP. These are event-driven grab samples that have no

associated flow measurements. The data are provided in **Table 4**, which shows extremely high TP concentrations (mean concentrations ranging from 310 ppb to 1,656 ppb).

### ***"Within" Structures***

For structures discharging "within" the EPA during WY2003, low TP concentrations were observed for structures S-12D and S-333, which convey discharges from WCA-3A to the Park (**Figure 2b**). The monitoring location for S-12D serves as a surrogate monitoring location for the non-ECP permit structures G-71, S-346, and S-347. The median TP concentrations at these monitoring locations were 11 ppb and 12 ppb at S-12D and S-333, respectively, with 75 percent of the data below 15 ppb for S-12D and S-333. The maximum concentration observed was 23 ppb for S-12D and S-333, respectively. The discharge volumes for the period were 226,449 ac-ft for S-12D, and 207,064 ac-ft for S-333.

Higher concentrations were observed at structures S-145 which convey discharges from WCA-2A to WCA-2B. The structures usually operate simultaneously. Maximum concentration was 77 ppb, median value was 12 ppb, and 75 percent of the data (17 samples) was below 22 ppb at S-145. Discharge volumes ranged from 22,790 ac-ft at S-146, to 39,656 ac-ft at S-145.

In addition to monitoring the water quality at structure S-34, the data from the location are representative of the water quality conditions for structure S-141, which conveys discharges from WCA-2B to the North New River Canal just upstream of S-34. The TP concentrations from the S-34 location ranged from 9 ppb to 58 ppb, with a median value of 20 ppb.

The highest TP concentrations were observed at structures S-10E and S-151 and at the monitoring site C123SR84, the surrogate location for structures S-339 and S-340. The S-10E structure conveys discharges from the Refuge to the northern portion of WCA-2A downstream of pump station S-6. Sampling at the S-10E location occurs upstream of the structure and is near the western rim canal in the Refuge. During WY2003, the S-10E structure remained closed (Appendix 8B-1a, Table 2). The TP concentrations (non-flow event) for S-10E ranged from 29 ppb to 128 ppb, with a median concentration of 52 ppb. Structure S-151 discharged approximately 125,116 ac-ft during WY2003. TP concentrations ranged from 13 ppb to 37 ppb, with a median value of 18 ppb. Structures S-339 and S-340, located upstream of S-151 in the Miami Canal, discharged about 269,546 ac-ft for S-339 and 109,209 ac-ft for S-340. TP concentrations at C123SR84 ranged from 10 ppb to 109 ppb, with a median value of 33 ppb.

### ***"From" Structures***

The TP concentrations collected during WY2003 for the structures classified as "from" are summarized in the box and whisker plot shown in **Figure 2c**. Structure G-94B exhibited the highest TP concentrations, which ranged from 26 ppb to 143 ppb. The median TP concentration at this structure was 47 ppb, with 75 percent of the data below 51 ppb. G-94B is also the surrogate sampling site for structures G-94A and G-94C. All three structures are located in the L-40 levee on the eastern side of the Refuge and provide water supply releases from the Refuge to the Lake Worth Drainage District (LWDD). Additionally, the District owns and maintains the structures, but the LWDD operates them.

The G-94A and G-94B structures, when open, allow interior LWDD canals to fill. The direction of flow always has been toward the LWDD canal system. The G-94C structure is operated similarly.

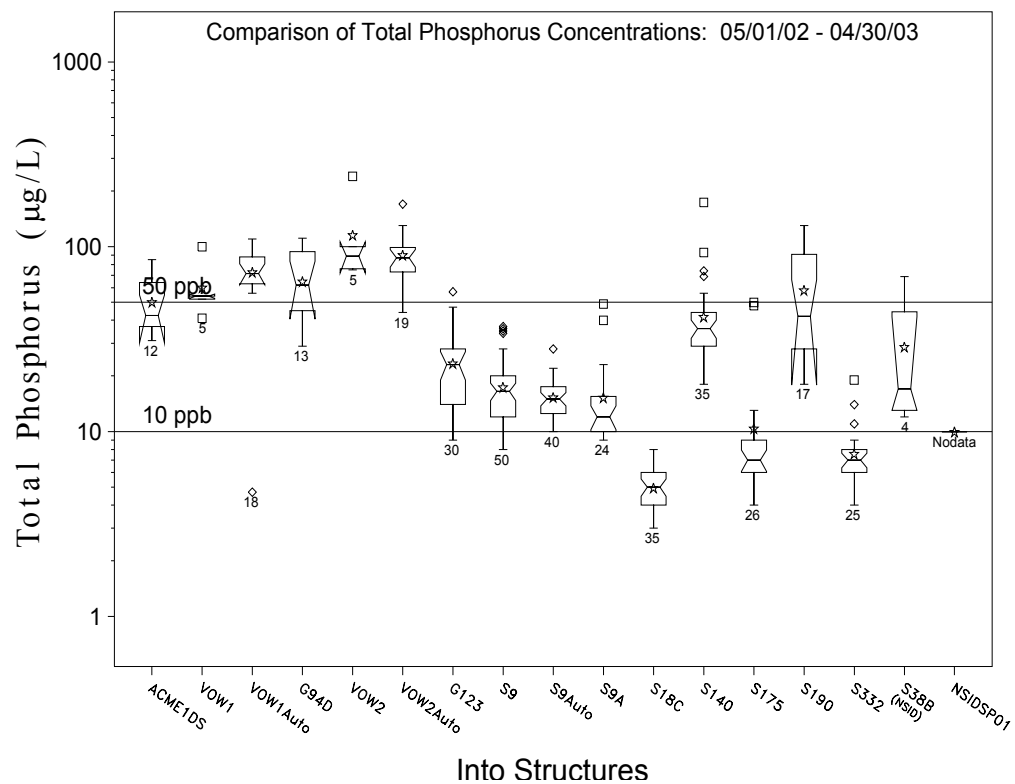
The G-94C structure was used intermittently for water supply purposes. The total discharge from the Refuge to the LWDD system was approximately 23,397 ac-ft (Appendix 8B-1a, Table 2). Operational records were unavailable to determine the frequency and magnitude of water supply releases to LWDD canals during WY2003 by way of the G-94A and G-94B structures.

The next highest TP concentrations were observed at S-39, with TP concentrations ranging from 12 ppb to 74 ppb, with a median value of 29 ppb. The structure discharged approximately 206,697 ac-ft during WY2003. During that period, four samples were collected at S-344. The TP concentrations ranged from 9 ppb to 63 ppb and the median concentration for the four samples was 14 ppb.

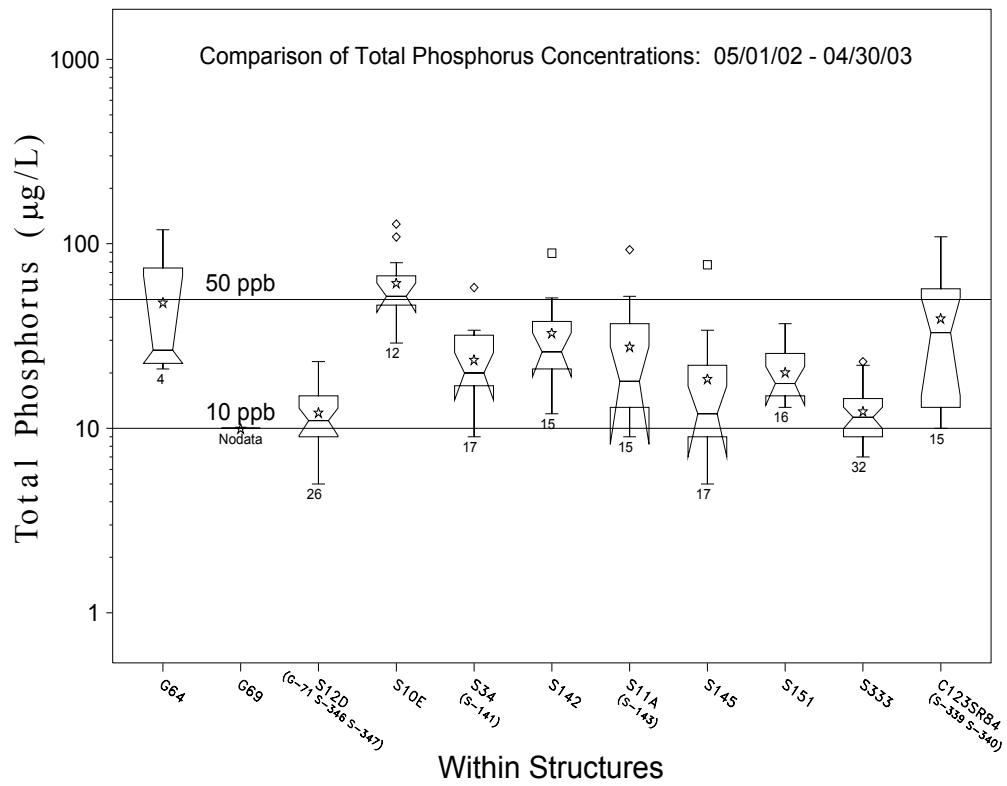
For the remainder of the “from” structure monitoring locations (S-31, S-34, S-38, S-334, S-337, S-343A, and S-343B), 75 percent of the observed TP concentrations were below 33 ppb, with median values ranging from 12 ppb to 20 ppb.

### ***C-111 Basin Upstream Structures***

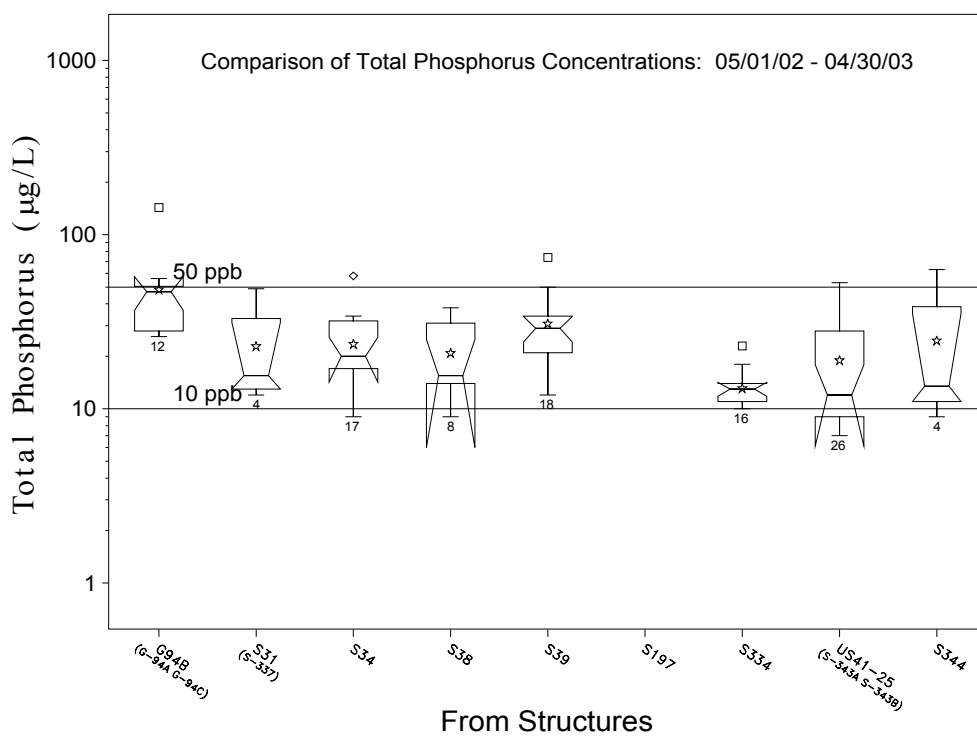
Structures S-176, S-177, S-178, S-331, and S-173, shown in **Figure 2d**, are C-111 basin structures located upstream of “into” structures S-18C, S-332, and S-175. Seventy-five percent of the TP concentration data collected for these structures was below 31 ppb, with the median values ranging between 4 ppb and 21 ppb. The maximum TP at S-178 is 122 ppb, with a median TP concentration of 21 ppb, which was significantly higher than the rest of the C-111 basin upstream structures.



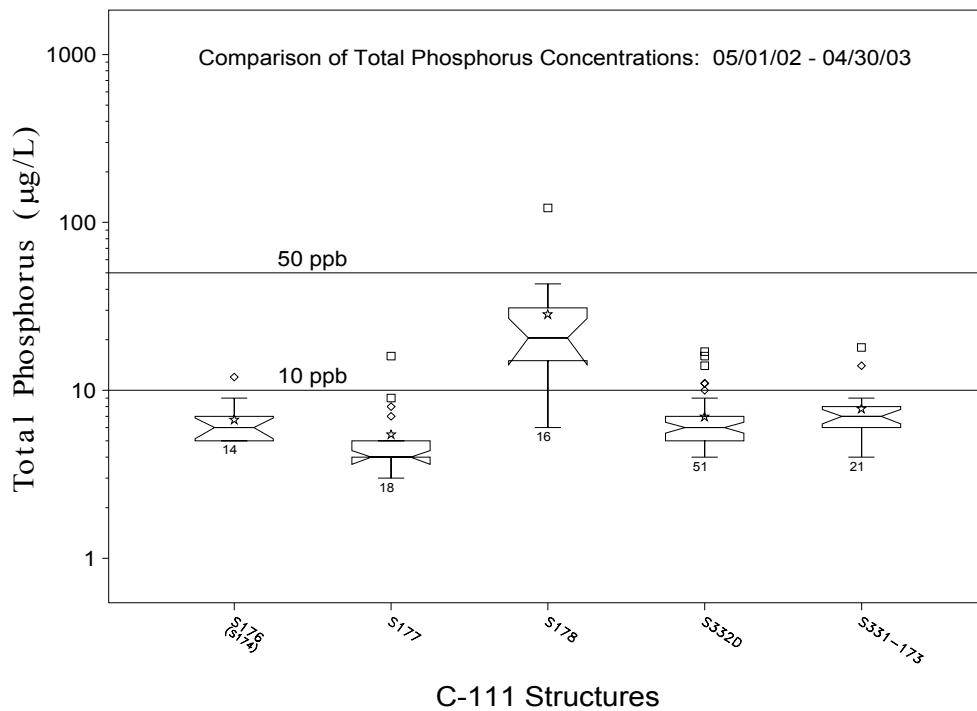
**Figure 2a.** Comparison of TP concentrations for “Into” structures during WY2003.



**Figure 2b.** Comparison of TP concentrations for “Within” structures during WY2003.



**Figure 2c.** Comparison of TP concentrations for "From" structures during WY2003.



**Figure 2d.** Comparison of TP concentrations for C-111 upstream structures during WY2003.

### ***Flow-Weighted Mean TP Concentrations for All Structures***

Extending the analysis from previous water years, flow-weighted mean TP concentrations were calculated for all the structures during WY2003. The non-ECP permit does not require an annual flow-weighted mean concentration to be calculated. However, the analysis is useful for determining whether additional sampling is required during flow events and provides a more accurate depiction of expected concentrations during flow events. The calculation for flow-weighted mean TP concentrations was accomplished for structures having sufficient TP data and available flow data for WY2003.

There are several common methods that can be used to calculate a flow-weighted mean. The most common method is to multiply the concentration data by the flow data on days with available flow and concentration values, add the results to obtain total daily loads, and then divide the sum by the total accumulated flow for those days. This method uses only the data that were collected and does not involve estimating concentration data for other days when flow occurred. The annual flow-weighted mean TP concentrations, and monthly and annual flow volumes for the “into,” “within,” “from,” and “C-111 basin” structures during WY2003 are provided in Appendix 8B-1a, Table 2.

A more detailed analysis of the WY2003 annual flow-weighted mean TP concentration data for each “into” structure is shown in **Table 4**. The calculations were based on two methods for determining flow-weighted mean concentrations. The first method calculates the flow-weighted mean TP concentration using only days of flow and associated TP data. The second method uses an estimation algorithm to determine TP concentrations on all days with positive flow for which no observed values are available.

The two methods resulted in similar calculations for the flow-weighted mean concentration at most of the “into” structures. The calculation methods yielded slightly different results for the G-94D site (117 ppb versus 92 ppb) and the S-140 site (65 ppb versus 62 ppb). **Table 4** presents the results for the flow-weighted mean TP concentrations at “into” sites during WY2003. The highest flow-weighted mean TP concentration for the “into” structures during WY2003 was observed at the ACME2 pump station, followed by G-94D, S-190, ACME1, ACME1DS, and the S-140 pump stations. These sites are designated as a concern for TP.

The lowest flow-weighted mean TP concentrations were observed at the S-18C, S-175, and S-332 monitoring locations. These locations are the subject of interim and long-term compliance limits stipulated in the federal Settlement Agreement; therefore, these are viewed as a potential concern for TP.

**Table 4.** Annual flow-weighted mean TP concentrations for WY2003.

Hydrologic Basin	Structure	Water Quality Station Id	Total Flow Volume (acre-feet)	Sample Size (Grab)	Number of Days with Positive Flow	Arithmetic Average (Grab)( $\mu\text{g/L}$ )	Sample Size (Comp)	Sample Type	Total Samples Collected During Flow	Flow-Weighted <sup>2</sup> Mean Concentration ( $\mu\text{g/L}$ )	Flow-Weighted <sup>3</sup> Mean Concentration ( $\mu\text{g/L}$ )	TP Load (kg)
ACME (Basin B)	ACME1DS	ACME1DS	8,813 <sup>6</sup>	11	48 <sup>6</sup>	51	0	Grab <sup>4</sup>	3	80 <sup>7</sup>	76	827
	ACME1	VOW1	8,813	5	48	69	17 <sup>8</sup>	Auto <sup>5</sup> & Grab <sup>4</sup>	37	83	80	867
	G94D	G94D	9,469 <sup>6</sup>	16	75 <sup>6</sup>	92	0	Grab <sup>4</sup>	9	117 <sup>7</sup>	92	1,076
	ACME2	VOW2	9,469	5	75	143	19 <sup>8</sup>	Auto <sup>5</sup> & Grab <sup>4</sup>	67	108	119	1,387
North Springs Improv. District	NSID1	NSIDSP01	688	ND	ND	ND	0 <sup>9</sup>	Grab <sup>4</sup>	ND	ND	ND	ND
		S-38B (WCA-2A near NSID1)	688	4	4	29	0	Auto <sup>5</sup> & Grab <sup>4</sup>	0	ND	ND	ND
North New River	G-123	G123	0	30	0	23	48 <sup>8</sup>	Auto <sup>5</sup> & Grab <sup>4</sup>	0	ND	ND <sup>1</sup>	0
C-11 West	S-9	S9	264,301	50	214	17	36	Auto <sup>5</sup> & Grab <sup>4</sup>	219	17	17	5,580
	S-9A	S9A	ND	24	ND	15	23	Auto <sup>5</sup> & Grab <sup>4</sup>	ND	ND	ND	ND
C-111	S-175	S175	2,396	26	2	10	0	Grab <sup>4</sup>	2	10	9	27
	S-332	S332	547	26	9	8	0	Grab <sup>4</sup>	1	ND <sup>1</sup>	6	4
	S-18C	S18C	134,932	35	270	5	0	Auto <sup>5</sup> & Grab <sup>4</sup>	6	6	7	1,200
L-28	S-140	S140	136,367	35	200	42	39 <sup>8</sup>	Auto <sup>5</sup> & Grab <sup>4</sup>	189	65	62	10,191
Feeder Canal	S-190	S190	88,026	17	233	58	40 <sup>8</sup>	Auto <sup>5</sup> & Grab <sup>4</sup>	215	84	86	9,358
Boynton Farms	Various <sup>10</sup>	Various <sup>10</sup>	ND <sup>1</sup>	55	ND <sup>1</sup>	310-1656	ND <sup>1</sup>	Grab <sup>4</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>

## Notes:

- 1) ND - no data are available.
- 2) Flow-weighted mean concentration based on days of flow and monitored TP data only.
- 3) Flow-weighted mean concentration based on estimation algorithm to determine TP concentration on non monitored days
- 4) Grab indicates samples collected by grab sampling methodology.
- 5) Auto indicates that samples were collected by automatic composite samples.
- 6) Flow data from upstream pump structures, ACME1 and ACME2, is representative of the flow through the ACME1DS and G94D culverts, respectively.
- 7) Flow-weighted mean concentrations for ACME1DS and G94D were calculated using the flow data at upstream structures ACME1 and ACME2, respectively.
- 8) Auto-sampler installed upstream of structure during WY2001.
- 9) Auto-sampler installed upstream of structure during WY2002, but no data are available.
- 10) Sites include BFBAFCP, BFBAFNP, BFBAFSP, BFBDFCP, BFBDFNP, BFBDFSP, BFBDFWP, BFBMFCP, BFBMFSP, BFBMFNP, and BFBWNCNP.

## PESTICIDE MONITORING

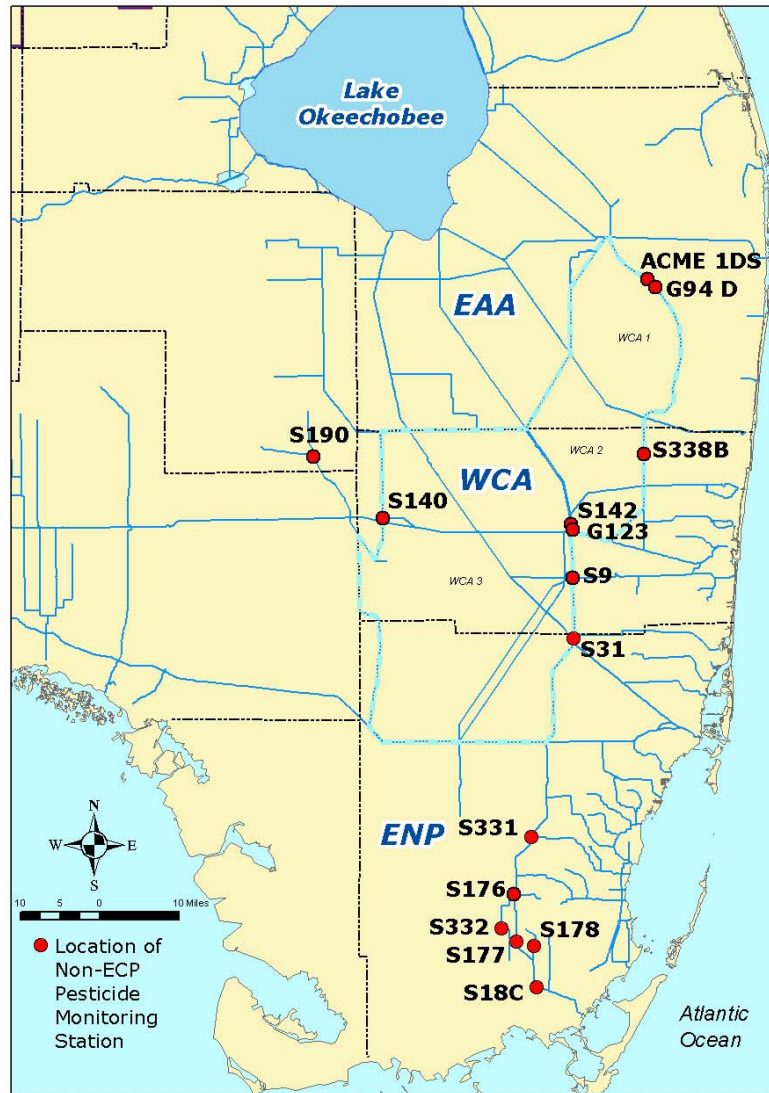
### Pesticides in Surface Waters and Sediments

The quarterly surface water and semiannual sediment pesticide sampling at the 15 non-ECP sites (**Figure 3**) for WY2003 was conducted during June 2002, September 2002, November 2002, and March 2003. Representative MDLs and PQLs for the pesticide analytes are listed in **Table 5**. The Department of Environmental Protection Central Laboratory in Tallahassee, Florida performed all the pesticide analyses. Refer to the Quality Assurance Evaluation section of the individual pesticide event reports for a summary of any limitations on data validity that might influence the utility of these data. The individual reports can be found online at the District's Website at <http://www.sfwmd.gov/curre/pest/pestindex.htm>.

To evaluate potential impacts on aquatic life resulting from intermittent pesticide exposure, the maximum observed concentration is compared to the criterion maximum concentration published by the U.S. Environmental Protection Agency (USEPA) under Section 304 (a) of the Clean Water Act (CWA), and as promulgated in Chapter 62-302, F.A.C. For compounds not specifically listed, Rule 62-302.200, F.A.C., allows for acute and chronic toxicity standards. These standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50 percent of the test organisms in 96 hours, where the 96-hour  $EC_{50}$  or  $LC_{50}$  is the lowest value determined for a species significant to the indigenous aquatic community. **Table 6** lists representative toxicity levels for selected freshwater aquatic invertebrates and fishes.

**Table 7** lists the pesticides detected in surface water samples collected during WY2003. Four surface water samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than their respective Class III criterion or toxicity limit were assigned to the "concern" excursion category, whereas those higher than the PQL were assigned to the "potential concern" excursion category. None of the surface water detections were identified as a concern.

**Table 8** lists the pesticides detected in the sediment samples collected during WY2003. Two sediment samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than the PQL were assigned to the "potential concern" excursion category. Dichlorodiphenyldichloroethane (DDD), a dichlorodiphenyltrichloroethane (DDT) metabolite and insecticide, was detected at several locations at levels of "potential concern". Additionally, one detected concentration of endosulfan sulfate, which is a metabolite of the insecticide endosulfan, was identified at a level of "potential concern".



**Figure 3.** Pesticide monitoring network for non-ECP structures.

**Table 5.** Minimum detection limits (MDLs) and practical quantitation limits (PQLs) for pesticides determined in June 2002.

Pesticide or metabolite	Water: range of MDL-PQL (µg/L)	Sediment: range of MDL-PQL (µg/Kg)	Pesticide or metabolite	Water: range of MDL-PQL (µg/L)	Sediment: range of MDL-PQL (µg/Kg)
2,4-D	0.8 - 3.2	17 - 520	endosulfan sulfate	0.0019 - 0.0192	0.88 - 24.8
2,4,5-T	0.8 - 3.2	17 - 520	endrin	0.019 - 0.088	1.6 - 48
2,4,5-TP (silvex)	0.8 - 3.2	17 - 520	endrin aldehyde	0.0042 - 0.0192	0.82 - 24.8
alachlor	0.047 - 0.216	25 - 760	ethion	0.019 - 0.088	2.1 - 60
aldrin	0.0021 - 0.0096	0.41 - 12.4	ethoprop	0.019 - 0.088	4.1 - 124
ametryn	0.0094 - 0.044	2.1 - 60	fenamiphos (nemacur)	0.028 - 0.132	16 - 480
atrazine	0.0094 - 0.192	2.1 - 60	fonofos (dyfonate)	0.019 - 0.088	4.1 - 124
atrazine desethyl	0.0094 - 0.044	N/A	heptachlor	0.0023 - 0.0104	0.41 - 12.4
atrazine desisopropyl	0.0094 - 0.044	N/A	heptachlor epoxide	0.0019 - 0.0088	0.41 - 12.4
azinphos methyl (guthion)	0.019 - 0.088	2.1 - 60	hexazinone	0.019 - 0.088	8.2 - 248
α-BHC (alpha)	0.0021 - 0.0096	0.41 - 12.4	imidacloprid	0.2 - 0.4	NA
β-BHC (beta)	0.0032 - 0.0148	0.41 - 12.4	linuron	0.2 - 0.4	8.2 - 120
δ-BHC (delta)	0.0021 - 0.0096	0.82 - 24.8	malathion	0.028 - 0.132	6.2 - 184
γ-BHC (gamma) (lindane)	0.0019 - 0.0088	0.41 - 12.4	metalaxyl	0.047 - 0.216	NA
bromacil	0.038 - 0.172	16 - 480	methamidophos	NA	21 - 600
butylate	0.019 - 0.088	N/A	methoxychlor	0.0098 - 0.044	2 - 60
carbophenothion (trithion)	0.015 - 0.068	2 - 60	metolachlor	0.057 - 0.26	21 - 600
chlordane	0.0094 - 0.044	6.2 - 184	metribuzin	0.019 - 0.088	4.1 - 124
chlorothalonil	0.015 - 0.068	2 - 60	mevinphos	0.057 - 0.308	8.2 - 248
chlorpyrifos ethyl	0.019 - 0.088	2.1 - 60	mirex	0.011 - 0.052	1.6 - 48
chlorpyrifos methyl	0.0094 - 0.044	4.1 - 124	monocrotophos (azodrin)	NA	41 - 1240
cypermethrin	0.019 - 0.088	2 - 60	naled	0.075 - 0.348	33 - 1000
DDD-P,P'	0.0045 - 0.0208	0.82 - 24.8	norflurazon	0.019 - 0.088	4.1 - 124
DDE-P,P'	0.0038 - 0.0172	0.82 - 31.6	parathion ethyl	0.019 - 0.088	6.2 - 184
DDT-P,P'	0.0038 - 0.0172	1.2 - 36.8	parathion methyl	0.019 - 0.088	6.2 - 184
demeton	0.11 - 0.52	41 - 1240	PCB	0.019 - 0.088	8.6 - 560
diazinon	0.019 - 0.088	4.1 - 124	permethrin	0.015 - 0.068	2.5 - 180
dicofol (kelthane)	0.042 - 0.192	6.2 - 184	phorate	0.028 - 0.132	2.1 - 60
dieldrin	0.0019 - 0.0088	0.41 - 12.4	prometryn	0.019 - 0.088	6.2 - 184
disulfoton	0.019 - 0.088	4.1 - 124	prometon	0.019 - 0.088	NA
diuron	0.2 - 0.4	8.2 - 120	simazine	0.0094 - 0.044	2.1 - 60
α-endosulfan (alpha)	0.0038 - 0.0172	0.41 - 12.4	toxaphene	0.071 - 0.328	31 - 920
β-endosulfan (beta)	0.0038 - 0.0172	0.41 - 12.4	trifluralin	0.0075 - 0.0348	1.6 - 48

NA = not analyzed

**Table 6.** Toxicity of pesticides (g/L) to selected freshwater aquatic invertebrates and fishes.

Common name	48 hr EC50			96 hr LC50			96 hr LC50		
	Water flea			Fathead Minnow (#)			Bluegill		
	<i>Daphnia</i>	acute	chronic	<i>Pimephales</i>	acute	chronic	<i>Lepomis</i>	acute	chronic
	<i>magna</i>	toxicity (*)	toxicity (*)	<i>Promelas</i>	toxicity	toxicity	<i>macrochirus</i>	toxicity	toxicity
2,4-D	25,000 (7)	8333	1250	133,000 (7)	44333	6650	180,000 (8)	60000	9000
	-	-	-	-	-	-	900 (48 hr) (6)	-	-
Ametryn	28,000 (7)	9333	1400	-	-	-	4,100 (4)	1367	205
Atrazine	6900 (7)	2300	345	15,000 (7)	5000	750	16,000 (4)	5333	800
Bromacil	-	-	-	-	-	-	127,000 (7)	42333	6350
DDD, p,p'	3,200 (6)	1067	160	4,400 (1)	1467	220	42 (1)	14	2.1
DDE, p,p'	-	-	-	-	-	-	240 (1)	80	12
Diuron	1,400 (7)	467	70	14,200 (7)	4733	710	5,900 (4)	1967	295
Endosulfan	166 (7)	55	8	1 (1)	0.3	0.05	1 (1)	0.33	0.05
	-	-	-	-	-	-	2 (3)	0.67	0.10
	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
Hexazinone	151,600 (7)	50533	7580	274,000 (4)	91333	13700	100,000 (7)	33333	5000
Norflurazon	15,000 (7)	5000	750	-	-	-	16,300 (7)	5433	815
Prometon	-	-	-	-	-	-	40,000 (5)	13333	2000
Simazine	1,100 (7)	367	55	100,000 (7)	33333	5000	90,000 (4)	30000	4500
Trifluralin	625 (7)	208	31	105 (7)	35	5	60 (4)	20	3

(\*) Florida Administrative Code (FAC) 62-302.200, for compounds not specifically listed, acute and chronic toxicity standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50% of the test organisms in 96 hours, where the 96 hour LC50 is the lowest value which has been determined for a species significant to the indigenous aquatic community.

(#) Species is not indigenous. Information is given for comparison purposes only.

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**Table 6.** Continued.

common name	96 hr LC50			96 hr LC50			96 hr LC50		
	Largemouth Bass			Rainbow Trout (#)			Channel Catfish		
	<i>Micropterus</i>	acute	chronic	<i>Oncorhynchus</i>	acute	chronic	<i>Ictalurus</i>	acute	chronic
	<i>salmoides</i>	toxicity	toxicity	<i>Mykiss</i>	toxicity	toxicity	<i>punctatus</i>	toxicity	toxicity
2,4-D	-	-	-	100,000 (4)	33333	5000	-	-	-
	-	-	-	110,000 (7)	36667	5500	-	-	-
ametryn	-	-	-	8,800 (4)	2933	440	-	-	-
atrazine	-	-	-	8,800 (4)	2933	440	7,600 (4)	2533	380
bromacil	-	-	-	36,000 (7)	12000	1800	-	-	-
DDD, p,p'	42 (1)	14	2.1	70 (1)	23.3	3.5	1,500 (1)	500	75
DDE, p,p'	-	-	-	32 (1)	10.7	1.6	-	-	-
diuron	-	-	-	5,600 (4)	1867	280	-	-	-
endosulfan	-	-	-	1 (1)	0.33	0.050	1 (1)	0.3	0.05
	-	-	-	3 (2)	1	0.15	1.5 (7)	0.5	0.08
	-	-	-	1 (3)	0.33	0.050	-	-	-
	-	-	-	0.3 (5)	0.10	0.015	-	-	-
hexazinone	-	-	-	180,000 (7)	60000	9000	-	-	-
norflurazon	-	-	-	8,100 (7)	2700	405	>200,000 (4)	>67,000	>10,000
prometon	-	-	-	12,000 (5)	4000	600	-	-	-
simazine	-	-	-	100,000 (7)	33333	5000	-	-	-
trifluralin	75 (7)	25	4	30 (4)	10	1.5	210 (7)	70	11

(\*) Florida Administrative Code (FAC) 62-302.200, for compounds not specifically listed, acute and chronic toxicity standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50% of the test organisms in 96 hours, where the 96 hour LC50 is the lowest value which has been determined for a species significant to the indigenous aquatic community.

(#) Species is not indigenous. Information is given for comparison purposes only.

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**Table 7.** Pesticide detections and excursions for surface water samples collected from May 2002 to April 2003.<sup>1</sup>

Structure	Compound															
	2,4-D	ametryn	atrazine	atrazine desethyl	atrazine desisopropyl	bromacil	diuron	alpha endosulfan	beta endosulfan	endosulfan sulfate	hexazinone	prometon	norflurazon	simazine		
ACME1DS		3:1:0*	0:4:0	2:0:0							1:0:0					
G-94D		3:1:0	0:4:0	2:0:0							1:0:0					
G-123		1:0:0	1:1:0	1:0:0												
S-9			1:2:0	1:0:0												
S-18C			2:0:0							1:0:0						
S-140			0:2:0	1:0:0		0:2:0					2:0:0		1:1:0	0:1:0		
S-190			2:0:0		1:0:0		1:0:0						4:0:0	1:1:0		
S-332			0:1:0													
S-38B	0:1:0	4:0:0	0:4:0	0:3:0	1:0:0							3:0:0				
S-142		4:0:0	1:2:0	2:0:0												
S-31			0:3:0													
S-176			0:4:0													
S-177			2:0:0					1:0:0		1:0:0						
S-178			1:0:0		1:0:0			0:1:0	1:0:0	0:2:0						
S-331/S-173			2:2:0	1:0:0												

## Notes:

<sup>1</sup> Four samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

\* Number of samples < = PQL (no concern); number of samples > PQL (potential concern); and number of samples exceeding criterion or toxicity limit (concern).

**Table 8.** Pesticide detections and excursions for sediment samples collected in June 2002 and November 2002.<sup>1</sup>

Structure	Compound							
	bromacil	DDD-p,p'	DDE-p,p'	alpha endosulfan	beta endosulfan	endosulfan sulfate	BHC gamma (lindane)	trifluralin
ACME1DS		1:0*	0:2				1:0	
G-94D			2:0					
G-123								
S-9								
S-18C								
S-140								
S-190								
S-332								
S-38B		1:0	0:1					
S-142								
S-31								
S-176	1:0							1:0
S-177			1:0					
S-178			0:1	1:0	1:0	0:1		
S-331/S-173								

## Notes:

<sup>1</sup> Two sediment samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

\* Number of samples < PQL (no concern); and number of samples > PQL (potential concern).

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